70

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09/879,529	06/12/2001	Junya Shimizu	JP920000126US1	3180

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EXAMINER	
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ART UNIT	**PAPER NUMBER**
2621	

DATE MAILED: 11/01/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/879,529	Applicant(s) SHIMIZU ET AL.	
	Examiner Dennis Rosario-Vasquez	Art Unit 2621	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *Amed. June 28, 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-31* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-31* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *12 June 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

Response to Amendment

Specification

1. The disclosure is objected to because of the following informalities:

Page 10, line 15:"doubled" ought to be amended to "double".

Page 11, line 16, "the user preference" ought to be amended to "based on a user preference".

Appropriate correction is required.

Claim Objections

2. The following quotations of 37 CFR § 1.75(a) is the basis of objection:

(a) The specification must conclude with a claim particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention or discovery.

Claims 5,9,13 and 18 are objected to under 37 CFR § 1.75(a) as failing to particularly point out and distinctly claim the subject matter which the applicant regards as his invention or discovery.

Claim 5, line 5:"said image" has no antecedent basis. "said image" can be refereeing to "original input image data" in lines 1,2 or "forming an image" in line 3.

Claim 9, line 4, "doubled" ought to be amended to "double".

Claim 13, lines 2,3: "the ranked median value selection" has no antecedent basis. ""the ranked median value selection" ought to be amended to "**a** ranked median value selection."

Claim 13, line 4:"the linearly expanded image data" has no antecedent basis.

Claim 18, lines 2,3: "said original color image data" has no antecedent basis.

Response to Arguments

3. Applicant's arguments with respect to claims 1-31have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

5. Claims 1-5,7-18,20-31are rejected under 35 U.S.C. 102(e) as being anticipated by Dube et al. (US Patent 6,782,143 B1).

Regarding claim 1, Dube et al. discloses an image transform method comprising:

a) transforming original input image data (fig. 1, num. 22:Initial Image Data) into image data (Fig. 1, label" Enlarged Data Image") expanded by a ratio ("factor") represented by a rational number or an integer ("2"), including the steps of:

a1) reducing correlation in the vertical (Fig. 10, num. 178: Interpolator smoothes an image that has a strong correlation in the X and Y directions determined in figure 10, num. 74:Classification of Image Content for Portion of Image. According to the specification reducing correlation corresponds to figure 3(b) that is a smoothed image as described in the Dube et al. reference.) and horizontal (Fig. 10, num. 180: Interpolator) directions (X corresponds to horizontal and Y corresponds to vertical directions.) of an image (Fig. 1 or Fig. 10, num. 26) that is linearly expanded (Fig. 10, label "Y" block) in the vertical and horizontal (Fig. 10, label "X" block.) directions to generate first expanded image data (The outputs of the "X" and "Y" blocks are first linearly expanded image data.);

b1) performing linear interpolation (Fig. 182, num. Interpolator), based on correlation with a target pixel (Fig. 2, label "F" is the target pixel) constituting said original image data (Fig. 1 and fig. 2, num. 26) and neighboring pixels ("A", "C", "I" and "K") arranged in oblique directions (Fig. 2 numerals 40 and 38 are diagonal lines along "A,C,I and K".), using said neighboring pixels ("A,C,I and K" of fig. 2, num. 26.) to generate second expanded image data ("Z" of fig. 2,num. 30 is the second expanded data which corresponds the output of the "Z" block of fig. 10.); and

c1) employing (Fig. 10 employs an adder next to numeral. 56.) said first expanded image data (Output of the "X" and "Y" blocks of figure 10.) and said second expanded image data (Output of the "Z" block of fig. 10.) to generate a final image (Fig. 10, num. 56,"X,Y,Z").

Regarding claim 2, Dube et al. discloses the image transform method according to claim 1, wherein said step of generating said first expanded image data (The outputs of the "X" and "Y" blocks are first expanded image data.) includes the steps of:

a) raster-scanning a window (Fig. 3A corresponds to an original window of fig. 1, num. 26 raster-scanning in col. 4, lines 44-54.) having a predetermined size (4 X 4 pixels) wherein a target pixel ("F") and its neighboring pixels ("E" , "G", "H" for a horizontal "X row" and "B", "J" and "N" for a vertical "Y column".) in the linearly expanded image data (The outputs of the "X" and "Y" blocks are first linearly expanded image data which corresponds to the expanded image 30 shown in fig, 2.) are included ("E" , "G", "H" for a horizontal "X row" and "B", "J" and "N" for a vertical "Y column" are included with the linearly expanded data of fig. 2, num. 30.); and

b) reducing (Fig. 11A is a table with a "Smooth" row that is used by interpolators 178 and 180 of fig. 10.) vertical (Fig. 10, num. 180:Interpolator for the Y or vertical direction) and horizontal directional (Fig. 10, num. 178: Interpolator for the X or horizontal direction.) correlation through a rank order processing (Fig. 8B shows a rank order processing from left to right of a row (fig. 2, has an "X row" arrow from left to right) using 140:X Row Selector.) in the window (Fig. 3A corresponds to an original window of figs. 1 and 2, num. 26 raster-scanning in col. 4, lines 44-54.).

Regarding claim 3, Dube et al. discloses the image transform method according to claim 1, wherein said step of generating said second expanded image data ("Z" of fig. 2,num. 30 is the second expanded data which corresponds the output of the "Z" block of fig. 10.) includes the steps of:

a) determining an oblique interpolation direction (An interpolation table in figure 11A shows "135 degree" that corresponds to a cubic interpolation in the "Z" column. Note that the "Z" column in fig. 11A corresponds to the output of the "Z" block of fig. 10.) based on values of differences (Fig. 11B shows a series of equations at the bottom of the figure that calculates differences between pixels A,B,C,D that correspond to pixels F,A,C,I and K in the "Z" column.)between said target pixel (Fig. 2, label "F" is the target pixel) and said neighboring pixels ("A", "C", "I" and "K"); and

b) performing (Fig. 10, num. 182:Interpolator) linear interpolation ("Cubic1 (A,F,K,P)" in the "Z" column of fig. 11A is linear interpolation performed by the interpolator 182 of fig. 10.) in said oblique interpolation direction (An interpolation table in figure 11A shows "135 degree" that corresponds to a cubic interpolation in the "Z" column. Note that the "Z" column in fig. 11A corresponds to the output of the "Z" block of fig. 10.).

Regarding claim 4, Dube et al. discloses the image transform method according to claim 1, further comprising the step of:

a) regarding, as an adjustment value ("classification criteria" in col. 5, line 15), the personal preference of a user concerning image quality (Fig. 1,num. 50: Classifier uses criteria from an user in col. 5, lines 13-17.),

wherein, at said step of generating said final image (Fig. 10, num. 56,"X,Y,Z"), based on said adjustment value ("classification criteria" in col. 5, line 15), said final image (Fig. 10, num. 56,"X,Y,Z") is generated (Via an adder in figure 10.) by using said first (The outputs of the "X" and "Y" blocks are first linearly expanded image data.) and said second expanded image data ("Z" of fig. 2,num. 30 is the second expanded data which corresponds the output of the "Z" block of fig. 10.).

Regarding claim 5, Dube et al. discloses an image transform method comprising:

a) transforming original input image data (fig. 1, num. 22: Initial Image Data) into image data expanded (Fig. 1, num. 56:X,Y,Z) by a ratio represented by a rational number or an integer ("[scaling] factor, s, equal to two (col. 6, line 18)."), including the steps of:

a1) forming an image (Fig. 2, num 30 is an image) by linearly expanding original image data (Fig. 2,num. 26 is an original image.) in the vertical ("Y column" arrow of fig. 2, num. 30) and horizontal directions ("X row" arrow of fig. 2, num. 30); and

a2) reducing (Fig. 10, num. 178 and 180 are interpolators for the X and Y directions.) the vertical (Fig. 2,num. 36) and horizontal (Fig. 2,num. 34) directional correlation (The image of fig. 2, num. 26 corresponds to a smooth "region having a high degree of correlation" in col. 7, lines 17-19. Thus, a smooth image with high correlation will not have a high correlation when interpolated with new points XYZ of fig. 2, num. 30.) of said image (fig. 2, num. 26) through a rank order processing (Fig. 8B shows a rank order processing from left to right of a row (fig. 2, has an "X row" arrow from left to right) using 140:X Row Selector.) to generate a final expanded image (fig. 2, label" Enlarged Data Image" is an output device that outputs an expanded image.).

Claim 7 is similar to claim 1, except fore the limitation of calculating differences in the right oblique and left oblique directions which is disclosed by Dube et al. in figure 11A which show a table with a "Z" column that calculates a left oblique 135 degree and right oblique 45 degree using the formula for Cubic1 interpolation shown at the bottom of figure 11B.)

Regarding claim 8, Dube et al. discloses the image transform method according to claim 7, further comprising the steps of:

a) reading peripheral pixels (Fig. 10, num. 26 shows a block of peripheral pixels B,G,J and E.) arranged within a predetermined mask range (5 X 5 block) adjacent to said target pixel ("F" of fig. 10, num. 26) and/or said neighboring pixels ("A,CI and K" of fig. 10, num. 26); and

b) accumulating differences (Fig. 10, num. 74:Classification of Image Content for Portion of Image accumulates different contents of smoothness, edge, and texture.) between said peripheral pixels (Fig. 10, num. 26 shows a block of peripheral pixels B,G,J and E.), and between said target pixel ("F" of fig. 10, num. 26) and said neighboring pixels ("A", "C", "I" and "K" of figs. 1,2, and 10 num. 26.); and

c) determining an interpolation direction (Fig. 10, num. 170: Interpolation Rulebase uses a set of rules shown in figures 11A and 11B to determine an interpolation direction in the X,Y and Z directions.), based on the cumulative value (The output of the classifier 74 is inputted to 170 .) of said differences (Fig. 10, num. 74:Classification of Image Content for Portion of Image accumulates different contents of smoothness, edge, and texture.); and

d) performing interpolation in said interpolation direction (Fig. 10, numerals 172-176 are interpolators for the X,Y and Z directions.).

Regarding claim 9, Dube et al. discloses an image transform method comprising:

a) an input step of entering original image data to be expanded by a magnification of two or more (Addressed in claim 1);

b) a first process step (Fig. 10, num. 180:Interpolator.) of reducing the step-shapes or chain-shapes (The interpolator reduces artifacts of edges in col. 10, lines 24-26.) of oblique lines (edges) appearing when said original image data (Fig. 1, num. 26) are expanded by double[d] or greater in size;

c) a second process step of expanding (Fig. 10,num. 182:Interpolator), in the oblique direction (Z diagonal direction from fig. 10,num. 176), the structure("Image Content" in fig. 10,num. 74.) of said original image data (Figs. 1 and 10,num. 26), and reducing a bulging shape (The interpolators prevents rings and artifacts that blur in col. 10, lines 24-26. Note that the interpolators use rule 2 that prevents the above rings and artifacts.) appearing when a portion is expanded whereat vertical and horizontal lines (Fig. 10, num. 26 contains "image content [that] includes an edge and there is no identified path of isobrightness [or direction] (col. 10, lines 19-22).") of said original image data (Fig. 10,num. 26) cross each other (The image content corresponds to text mentioned in col. 1, lines 65-66 or a letter "T" that has crossing horizontal and vertical line); and

d) an output step (Fig, 10,num. 56:X,Y,Z) of outputting an image (Fig. 2,num. 30 is an expanded image) expanded by said magnification of two or more using said first (Fig. 10, num. 180:Interpolator.) and second (Fig. 10,num. 182:Interpolator) process steps .

Regarding claim 10, Dube et al. discloses an image processing apparatus comprising:

a) input means(Fig. 1, num. 24: Portion Selector) for entering original image data (Fig. 1, num. 22: Initial Image Data) to be expanded ("Enlarged" in fig. 1);

b) vertical and horizontal directional interpolation means (Fig. 1, num. 54:Adaptive Interpolator) for interpolating said original image data (Fig. 1, num. 22: Initial Image Data) in the vertical ("Y column" in fig. 2) and horizontal directions ("X row" in fig. 2);

c) vertical and horizontal directional correlation reduction means (Fig. 10, num. 170:Interpolation Rule Base performs a "Smooth" interpolation for the X and Y directions as shown in the "X" and "Y" columns of fig. 11A.) for reducing correlation of the obtained image in the vertical and horizontal directions;

d) oblique direction detection means (Fig. 10, num. 74:Classification of image Content for Portion of Image) for detecting an oblique direction(Z diagonal direction) having a strong correlation (Fig. 10, num. 74:Classification of image Content for Portion of Image detects pixels in the "Z Diag[onal]" direction with a "Strong Correlation" shown in the block of fig. 10, numeral 74.) with a target pixel (Figure 2 and 10, num. 26 contains target pixel "F") and neighboring pixels ("A,B,C,E,G,I,J and K" of figs. 2 and 10. num. 26) in said original image data (Fig. 1, num. 22: Initial Image Data contains pixels "A-K" via a Portion Selector 24 to generate the image of fig. 2 and 10, num. 26.); and

e) directional interpolation means (Fig. 10, num. 176:Type of Interpolation for Z) for employing said neighboring pixels ("A,B,C,E,G,I,J and K" of figs. 2 and 10. num. 26) in said detected oblique direction (Fig. 10, num. 74:Classification of image Content for Portion of Image detects pixels in the "Z Diag[onal]" direction with a "Strong Correlation" shown in the block of fig. 10, numeral 74.) to perform interpolation in said oblique direction (Z diagonal direction).

Regarding claim 11, Dube et al. discloses the image processing apparatus according to claim 10, further comprising:

a) generation means (Fig. 1, label: Enlarged Data Image) for generating expanded image data (Fig. 2 is an enlarged image) based on an image obtained by said vertical and horizontal directional correlation reduction means (Fig. 10, num. 170:Interpolation Rule Base performs a "Smooth" interpolation for the X and Y directions as shown in the "X" and "Y" columns of fig. 11A.) and an image obtained by said oblique directional interpolation means (Fig. 10, num. 176:Type of Interpolation for Z).

Regarding claim 12, Dube et al. discloses the image processing apparatus according to claim 11, further comprising:

a) input means ("keyboard" in col. 14, line 3) for entering, as an adjustment value ("classification criteria" in col. 5, line 15), the personal preference of a user concerning image quality (Fig. 1,num. 50: Classifier uses criteria from an user in col. 5, lines 13-17.),

wherein said generation means (Fig. 1, label: Enlarged Data Image) employs said adjustment value ("classification criteria" in col. 5, line 15) to synthesize said image (Fig. 2 is an enlarged image) obtained by said vertical and horizontal directional correlation reduction means (Fig. 10, num. 170:Interpolation Rule Base performs a "Smooth" interpolation for the X and Y directions as shown in the "X" and "Y" columns of fig. 11A.) with (Via adder in figure 10 next to numeral. 56.) said image obtained by said oblique directional interpolation means (Fig. 10, num. 176:Type of Interpolation for Z).

Regarding claim 13, Dube et al. discloses the image processing apparatus according to claim 10, wherein said vertical and horizontal directional correlation reduction means (Fig. 10, num. 170:Interpolation Rule Base performs a "Smooth" interpolation for the X and Y directions as shown in the "X" and "Y" columns of fig. 11A.) performs [the] **a** ranked median value selection (Fig. 11A and 11B shows a detail of fig. 10, num. 170 that selects "Rule 2/Median...If not strong horizontal edge" based on a row or rank of pixels obtained from fig. 10, num. 74:"Strong Correlation X Row <Y/N>".), for the target pixel (Figure 2 and 10, num. 26 contains target pixel "F") and its neighboring pixels ("A,B,C,E,G,I,J and K" of figs. 2 and 10. num. 26) in the linearly expanded image data ("Enlarged" in fig. 1), and thereby reduces the correlation of an image in the vertical and horizontal direction.

Regarding claim 14, Dube et al. discloses the image processing apparatus according to claim 10, wherein said oblique direction detection means (Figs. 8A,8B and 10, num. 74:Classification of image Content for Portion of Image) employs differences (Fig. 8B determines similarity in fig. 8B,num. 148-160:"All Same?) between said target pixel ("F" of fig. 5, num. 26) and said neighboring pixels to detect ("A-E" and "G-P" of fig. 5, num. 26), with strong correlation (Fig. 8B,num. 150-162 determines a correlation.), said oblique direction (Z diagonal direction corresponds with difference 160 and correlation 162 and 144:Z Diagonals Selector of fig. 8B.), and said oblique directional interpolation means (Fig. 10, num. 176:Type of Interpolation for Z) performs linear Interpolation (cubic interpolation) in said oblique direction (Z diagonal direction) detected by said oblique direction detection means (Fig. 10, num. 74:Classification of image Content for Portion of Image detects the "Z Diag's" direction.).

Regarding claim 15, Dube et al. discloses an image processing apparatus comprising:

a) a vertical and horizontal directional linear interpolation unit (Fig. 10,num. 178 and 180 are interpolators for generating the horizontal, X and vertical, Y directions.) for forming an image ("X" and "Y" blocks outputted from numerals 178 and 180,respectively.) by linearly expanding original image data (Figs. 2 and 10, num. 26) in the vertical and horizontal directions ("Y column" arrow and "X row arrow" in figure 2 generate a linearly expanded mage 30); and

b) a vertical and horizontal directional correlation reduction processing unit (Fig. 10, num. 172 and 174 performs a type of interpolation.) for reducing (Smoothing is performed using the table of fig. 11A and 11B), for said image (Fig. 2, num. 30), a vertical and horizontal directional correlation (The image of figure 30 has a reduced correlation due to interpolation points X,Y and Z as compared to the high correlation to the image of figure 2, num. 26.) using a rank order processing (Fig. 8B shows a rank order processing from left to right of a row (fig. 2, has an "X row" arrow from left to right) using 140:X Row Selector. Note that the rank order processing result is 74 of fig. 10 and is used by the vertical and horizontal directional correlation reduction processing unit or fig. 10, num. 172 and 174 that performs a type of interpolation via numerals 170.) to generate a final expanded image (Fig. 10, num. 56: X,Y,Z is the final expanded image.),

c) operating in combination (Fig. 10,num. 178 and 180 are interpolators that receive data from fig. 10, num. 172 and 174.) for transforming the original input image data (Fig. 10, num. 26) into expanded image data (Fig. 10, num. 56:X,Y,Z).

Regarding claim 16, Dube et al. discloses an image processing apparatus comprising:

a) an interpolation direction determination unit (Fig. 5, num. 50: Classifier)

a1) for reading a target pixel ("F" of fig. 5, num. 26) and neighboring pixels ("A-E" and "G-P" of fig. 5, num. 26) in original image data (Fig. 1 num. 22: Initial Image Data),

a2) for calculating directional differences (Fig. 5, num. 92: Texture Map Processor uses the flowchart of figures 8A and 8B that calculates differences 148 for the horizontal X,154 for the vertical Y and 160 for the diagonal Z.) between said target pixel ("F" of fig. 10, num. 26) and said neighboring pixels pixels ("A-E" and "G-P" of fig. 10, num. 26) for right oblique (A diagonal direction "Z diagonal" shown in figure 2) and left oblique directions (Another "Z diagonal" direction shown in figure 2.),and

a3) for determining an interpolation direction (Fig. 5, label: Classification of Image Content of Portion of Image receives a direction from fig. 5, num 92 via num. 74.) based on said directional differences (Fig. 5, num. 92: Texture Map Processor calculates differences 148 for the horizontal X,154 for the vertical Y and 160 for the diagonal Z using the flowchart of figures 8A and 8B.); and

b) an oblique directional linear interpolation unit (Fig. 10, num. 182: Interpolator interpolates in the "Z diagonal" direction.)

b1) for performing linear interpolation ("Cubic" interpolation) for said target pixel ("F" of fig. 5, num. 26) by using said neighboring pixels ("A-E" and "G-P" of fig. 10, num. 26) arranged (AFKP for a diagonal or DGJM of another diagonal are used for cubic interpolation shown in a table of fig. 11A in the "Z" column.) in said determined interpolation direction (Figure 5, label: Classification of Image Content of Portion of Image receives the directional differences for interpolation at a later stage (fig. 10, num. 182).),

c) operating in combination (Fig. 5, num. 50: Classifier outputs data to Fig. 10, num. 182: Interpolator interpolates in the "Z diagonal" direction.) to transform the

original input image data (Fig. 1 num. 22: Initial Image Data) into expanded image data (Fig. 1, label "Enlarged Data Image").

Regarding claim 17, Dube et al. discloses the image processing apparatus according to claim 16, wherein said interpolation direction determination unit (Fig. 5, num. 50: Classifier)

a) reads peripheral pixels (Fig. 5, num. 26 shows a block of peripheral pixels B,G,J and E.) arranged within a predetermined mask range (5 X 5 block) adjacent to said target pixel ("F" of fig. 5, num. 26) and/or said neighbor pixels and

b) adds together (Fig. 8A shows an adder adding B,C,D between numerals B,C,D, 74,110 and 120, where BCD corresponds to difference outputs 148, 154 and 160 of fig. 8B.) the differences (Fig. 5, num. 92: Texture Map Processor uses the flowchart of figures 8A and 8B that calculates differences 148 for the horizontal X,154 for the vertical Y and 160 for the diagonal Z.) between said peripheral pixels (Fig. 10, num. 26 shows a block of peripheral pixels B,G,J and E.) and said target pixel ("F" of fig. 10, num. 26) and said neighbor pixels ("A", "C", "I" and "K" of figs. 1,2, and 10 num. 26.), and

c) determines said interpolation direction (Fig. 8A, num. 74:Classification of Image Content of Portion of Image receives the difference values outputted from the above adder.) based on the cumulative value (Output of the adder of fig. 8A.) of said differences (Fig. 5, num. 92: Texture Map Processor uses the flowchart of figures 8A and 8B that calculates differences 148 for the horizontal X,154 for the vertical Y and 160 for the diagonal Z.).

Regarding claim 18, Dube et al. discloses an image display device comprising:

a) first image expansion means (Fig. 10,num. 178 and 180:Interpolator) for reducing the step-shapes or chain-shapes of oblique lines (The interpolators reduce artifacts of edges in col. 10, lines 24-26.) in [said] **an** original color image data (Fig. 10,num. 26), and

a1) for outputting an expanded image (Fig. 10, "X" and "Y" block outputted from interpolators 178 and 180, respectively) wherein the vertical and horizontal structure is maintained (The interpolators 178 and 180 interpolate in the horizontal and vertical directions when an image is enlarged.);

b) second image expansion means (Fig. 182:Interpolator) for expanding the structure of said original color image data 9Fig. 10,num 26) in the oblique direction (Z diagonal direction outputted from interpolator 182.),

b1) for reducing a bulging shape that appears at intersections of lines (The interpolator reduces rings around edges in col. 10, lines 24-26.),

and

b2) for outputting an expanded image ("Z" block outputted from interpolator 182); and

c) display means (fig. 1, label, Enlarged Data Image is an output device.) for employing said expanded images (Fig. 1,num. 56 has the X,Y,Z blocks that represent expanded images.) obtained by said first (Fig. 10,num. 178 and 180:Interpolator) and said second (Fig. 182:Interpolator) image expansion means to display a final image (Fig. 1, label SN1 X SM1 image), operating in combination to transform low-resolution original color image data (Fig. 1, num .26) into high-resolution expanded color image data (fig. 1,label SN1 X SM1 is an enlarged image), and

c1) for outputting said high-resolution expanded color image data (fig. 1, label, Enlarged Data Image is an output device that outputs color mentioned in col. 11, line 49.).

Regarding claims 20-31 Dube et al. discloses a computer program in a module in col. 13, lines 43-47.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Avinash (US Patent 6,782,137 B1).

Dube et al. teaches an image transform method comprising the steps of:

a) determining (Fig. 1, num. 54: Adaptive Interpolator Linear/Nonlinear), for said expanded image (Fig. 1, label "Enlarged Data Image), whether the contrast ("sharp[ness]" in col. 6, line 10) in said original image data (Fig. 1, num. 26: Portion of Image data) can be maintained ("keep the image sharp" in col. 6, line 10) at a predetermined level (If the original image data has a strong edge, then a "Cubic1" interpolation in the row "Rule 3" of the table in fig. 11A is used to keep the image sharp when enlarging.)

Dube et al. does not teach the remaining limitations of claim 5, but does suggest "frequency space extrapolation" in col. 1, lines 36,37.

However, Avinash, in the field of endeavor display improvement, teaches the remaining portion of claim 6 of:

b) extracting a high frequency component ("Mid-frequency components" are extracted from fig. 8, num. 210 and mentioned in col. 9, lines 49,50.) from an expanded image (Fig. 8, num. 212), when a contrast can not be maintained (light and dark values of an input image are maintained through an equalization process in col. 2, lines 46-48 and shown in fig. 5 using a threshold T in step 110 of fig. 5.) at said predetermined level (Threshold "T"); and

c) adding said frequency component ("s(x,y)" in an "unsharp masking" formula equation shown in column 9, last equation.) multiplied by a constant ("NR2") to said expanded image (Fig. 8,num.212 is the image "s".), or subtracting said frequency component multiplied by a constant from said expanded image.

It would have been obvious at the time the invention was made to one of ordinary skill in the art to modify Dube et al.'s teaching of frequency space extrapolation with Avinash's teaching of extracting a mid-frequency components, because the mid-frequency components provides a boosted image to "avoid unnecessarily high contrast boost at very strong edges and very low contrast areas in a computationally efficient fashion (col. 6, lines 8-13)."

8. Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Dube et al. (US Patent 6,782,143 B1) in view of LoCiero et al. (US Patent 4,564,857 A).

Regarding claim 19, Dube et al. does not teach the limitations of claim 19, but does suggest removing unwanted artifacts in col. 2, lines 34,35.

However, LoCiero et al. teaches the limitations of claim 19 of:

an image display device (Fig. 14,num. 1350), wherein an original color image data (Fig. 10,num. 1003 outputs RGB data from a camera 1001.) includes thin lines obtained by anti-aliasing (LoCicero states, "camera 1001 is capable of functioning as a...line source of...[RGB] signals(col. 6, lines 33-35).") , and an image expansion means (Fig. 14,num. 1352:INTERPOLATION FILTER) performs interpolation based on pixels constituting the original thin lines, not based on pixels obtained by anti-aliasing (A filter 1002 :ANTI-ALIAS FILTERING filters lines from anti-aliasing, thus the interpolator 1352 of fig. 14 does not interpolate lines due to anti-aliasing because the lines were filtered out in fig. 10, num. 1002:ANTI-ALIAS FILTERING.).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to modify Dube et al.'s teaching of removing unwanted artifacts using an

interpolator with LoCicero's teaching of filtering anti-aliasing with an interpolator, because LoCicero's filtering to reduce anti-aliasing at an encoder (LoCiero et al, fig. 10, num. 1002) ensures proper samples are provided for later interpolation during decoding (LoCiero et al., fig. 11, num. 1352). As a result of using LoCicero's filtering, anti-aliasing components are eliminated before being interpolated.

Conclusion

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Kobayashi (US Patent 6,714,242 B1) is pertinent as teaching as method of directional interpolation using correlation values in fig. 5.

Aoyama et al. (US Patent 6,535,651 B1) is pertinent as teaching a method of interpolating edges (fig. 1,num. 41) and interpolating (fig. 1,num. 50) with a user input (fig. 1,num. 51).

Kuwahara et al. (US Patent 5,742,348 A) is pertinent as teaching a method of interpolating in fig. 3 using directions shown in fig. 22.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dennis Rosario-Vasquez whose telephone number is 703-305-5431. The examiner can normally be reached on 9-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Leo Boudreau can be reached on 703-305-4706. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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